

SCIENCE AND TECHNOLOGY HIGH PRIORITY RECOMMENDATIONS

SURVEILLANCE

- ✓ Increase surveillance (incident investigation) of outbreaks to better understand the magnitude of the problems
- ✓ Account for all types of illnesses
- ✓ Improve reporting accuracy and sharing of information

MONITORING PROGRAMS

- ✓ Establish consistent monitoring methodologies and protocols by developing a better correlation between polluted waters and pathogens
- ✓ Create standardized templates for characterizing the problems
- ✓ Reevaluate existing monitoring methodologies by comparing with actual outbreak events
- ✓ Monitor for turbidity, rainfall amount, wind direction, and standard water depth
- ✓ Define specific monitoring parameters for each locality and identify beach-specific criteria
- ✓ Measure parameters consistently
- ✓ Test for E. Coli and enterococci
- ✓ Develop appropriate sampling plans that include at least three samples at each sampling event

MONITORING TECHNOLOGY

- ✓ Need to be able to do rapid on-site monitoring (e.g., less than 2 hours)
- ✓ Need to do physical identification of sewage in the field
- ✓ Need to use monitoring technology for tracking sources of contamination
- ✓ Differentiate human and animal sources of contamination
- ✓ Need monitoring technology that is inexpensive to run
- ✓ Detection level of test should be as low as 1-10 colonies per 100 ml of water
- ✓ Must be capable of running multiple samples concurrently and sample preparation time should be short
- ✓ Analytical procedures must be simple

DATA TREND ANALYSIS

- ✓ Develop a list of risk factors for beaches that are risk-based, not just number base
- ✓ Build a complete database prior to modeling; update freshwater epidemiologic studies to help characterize beaches and find better indicators
- ✓ Develop beach monitoring networks, databases, inventories to aid in grouping beaches

BEACH ASSESSMENTS

- ✓ Develop rapid testing techniques to meet the needs of policy/decision makers and to avoid closing the beaches a day late
- ✓ Develop consistent closing criteria using bacterial indicators
- ✓ Address the variable E. coli issue by defining "at risk" beaches and publicize
- ✓ Update fresh water epidemiologic studies to help characterize beaches and find better indicators

VALIDATE METHODS

- ✓ Test the validity of current data collection methods by deploying them at various types of beaches

FUNDING

- ✓ Seek federal funding to sponsor epidemiological studies to provide scientific support for regulatory requirements

EDUCATION AND OUTREACH

- ✓ Increase public education and awareness with signage explaining health impacts of various behavior
- ✓ Develop and distribute educational tools
- ✓ Develop commercial campaign to increase public awareness of the communicable nature of gastro-intestinal disorders
- ✓ Compile best practices employed by different agencies, identifying common features

SCIENCE AND TECHNOLOGY

Following the Science and Technology Overview presentation, which discussed understanding health risks and new monitoring methods, the audience broke into one of four groups:

- ▶ Health Risks
- ▶ Predictive Modeling
- ▶ New Monitoring Methods
- ▶ Current Monitoring Methods

In each of these breakout sessions the groups developed prioritized lists of recommendations. The outcome of this process for each of the four topics are presented below.

Health Risks

Approximately 60 people attended this breakout session. Dr. Beach spent the first few minutes answering some general questions and then the group began identifying recommendations. The group produced the following 15 recommendations:

1. Increase surveillance of outbreaks to better understand the magnitude of the problems; account for all types of illnesses; and improve reporting accuracy.
2. Establish consistent monitoring methodologies.
3. Explore funding options to establish a dedicated lab for Great Lake beaches; (Note: concerns raised by MN and WI reps who identified this as a great need for non-Great Lake water bodies in their states).
4. Increase monitoring of polluted waters to establish better correlation between pollution and pathogens.
5. Seek federal funding to sponsor epidemiological studies to provide scientific support for regulatory requirements.
6. Develop standardized templates for defining /characterizing the problem.
7. Reevaluate standard monitoring methodologies based on comparisons with data associated with outbreak events.
8. Increase public education and awareness with signage explaining health impacts of various behavior.
9. Develop and distribute educational tools, including information and guidance, for local authorities.
10. Develop commercial campaign to increase public awareness of the communicable nature of gastro-intestinal disorders.

11. Develop a protocol to establish/require reporting from a variety of sources -doctors, nurses, health departments, etc. - to a central source to enable a more thorough statistical analysis of outbreaks (cluster).
12. Increase public understanding of pathogen exposure from the sand/shoreland.
13. Compile best practices employed by different agencies and identify common features.
14. Increase or promote more effective communication on beach issues between environmental protection agencies and public health organizations.
15. Create an Internet database to facilitate communication between federal, state, local agencies, and other stakeholder organizations.

Several monitoring-related recommendations were combined, as well as education and public outreach recommendations.

HIGH PRIORITY

1. **Surveillance.** (RI) Increase surveillance (incident investigation) of outbreaks to better understand the magnitude of the problems; account for all types of illnesses; and improve reporting accuracy and sharing of information.
2. **Monitoring.** (Combined R2, R4, R6, and R7) Establish consistent monitoring methodologies and protocols by developing a better correlation between polluted waters and pathogens; creating standardized templates for characterizing the problems; and reevaluating existing monitoring methodologies by comparing the actual outbreak events.
3. **Funding.** (R5) Seek federal funding to sponsor epidemiological studies to provide scientific support for regulatory requirements.
4. **Education and Outreach.** (Combined R8, R9, and R10). Increase public education and awareness with signage explaining health impacts of various behavior; develop and distribute educational tools; and develop commercial campaign to increase public awareness of the communicable nature of gastro-intestinal disorders.
5. **Best Practices.** (R13) Compile best practices employed by different agencies, identifying common features.

MEDIUM PRIORITY

1. **Dedicated Lab.** (R3) Explore funding to establish a dedicated lab for Great Lake beaches; (Note: concerns raised by MN and WI reps who identified this as a great need for non-Great Lake water bodies in their states).
2. **Reporting Protocol.** (RI 1) Develop a protocol to establish/require reporting from a variety of sources - doctors, nurses, health departments, etc. - to a central source to enable a more thorough statistical analysis of outbreaks (cluster).

3. **Pathogen Exposure.** (R12) Increase understanding of pathogen exposure from the sand/shoreland.
4. **Effective Communication.** (R14) Increase or promote more effective communication between environmental protection agencies and public health organizations on beach issues.
5. **Internet Database.** (R15) Create an Internet database to facilitate communication between organizations.

LOW PRIORITY

None

Predictive Modeling

The Predictive Modeling Breakout Session had about 20 people in attendance. The first half of the session was a discussion about different predictive models. The group then produced a list of the following 12 recommendations:

1. Do more detailed studies, collecting intensive data to develop more predictive modeling capability.
2. Develop materials/procedures to present predictive modeling, concepts and results in a manner that the public understands.
3. Educate the public on the concept of sliding risk; and risk communication concepts, such as a weather forecasting percent concept.
4. Develop approach/materials to communicate the economic impact of beach closings to beach managers.
5. Investigate the "value" of eliminating erroneous beach closings.
6. Have everyone collect the same type of data (now everyone collects different data).
7. Work toward developing standard operating procedures for labs and testing methods.
8. Develop standard quality control procedures.
9. Increase the breadth of the predictive models to include additional variables, such as sunlight.
10. Deploy sensors (weather buoys) to assist in data collection (capturing all data variables like the 63" Street Beach monitoring program).
11. Obtain "policy maker's" "buy-in" to monitoring and modeling approaches by determining what type of information they need to feel confident in making decisions.
12. Test the validity of current data collection methods by deploying them at various types of beaches.

Before assigning priorities to the recommendations, the group consolidated the similar recommendations. The recommendations were then prioritized high, medium, and low. These are presented below.

HIGH PRIORITY

1. **Data Collection.** (Combined R1, R6, R9 and R10) Collect more data and collect it consistently, increasing the breadth of the variables collected.
2. **Policy Makers.** (R11) Work with policy makers to determine their information needs to increase their confidence in making beach closing/opening decisions.
3. **Validate Methods.** (R12) Test the validity of current data collection methods by deploying them

at various types of beaches.

MEDIUM PRIORITY

1. **Education and Public Outreach.** (R2, R3, and R4) Develop materials/procedures to present predictive modeling concepts and results in a manner that the public understands; educate the public on the concept of sliding risk and risk communication concepts (weather forecasting percent concept); and develop approach/materials to communicate the economic impact of beach closings to beach managers.
2. **Beach Closings.** (R5) Investigate the "value" of eliminating erroneous beach closings.

LOW PRIORITY

1. **Quality Control.** (R7 and R8) Work toward developing standard operating procedures for labs and testing methods, and develop standard quality control procedures.

New Monitoring Methods

In the New Monitoring Methods Breakout Session the group discussed a variety of monitoring techniques and then proceeded to brainstorm what factors would be important in the "ideal" monitoring system. The group then produced the following 12 recommendations:

1. Need to be able to do rapid on-site monitoring (e.g., less than 2 hours); need to do physical identification of sewage in the field.
2. Need to use monitoring technology for tracking sources of contamination.
3. Develop technology that is easier to use, and that any person can perform monitoring.
4. Differentiate human and animal sources of contamination.
5. Need monitoring technology that is inexpensive to run.
6. Initial purchase price for equipment should be low.
7. Detection level of test should be as low as 1-10 colonies per 100 ml of water.
8. Must be capable of detecting viable cells in each sample.
9. Must be capable of running multiple samples concurrently.
10. Sample preparation time should be short.
11. Analytical procedures must be simple.
12. Need to be able to detect pathogens in addition to E. coli.

The group then proceeded to further refine the list of important factors into those that were most important by establishing a high priority list and a medium priority list. These are provided below.

HIGH PRIORITY

1. **Rapid Monitoring.** (R1) Need to be able to do rapid on-site monitoring (e.g., less than 2 hours); need to do physical identification of sewage in the field.
2. **Monitoring Technology.** (R2) Need to use monitoring technology for tracking sources of contamination.
3. **Contamination.** (R4) Differentiate human and animal sources of contamination.
4. **Technology.** (R5) Need monitoring technology that is inexpensive to run.
5. **Testing.** (R7) Detection level of test should be as low as 1-10 colonies per 100 ml of water.
6. **Sampling.** (R9 and R10) Must be capable of running multiple samples concurrently and sample

preparation time should be short.

7. **Procedures.** (R11) Analytical procedures must be simple.

MEDIUM PRIORITY

1. **Technology.** (R3) Develop technology that is easier to use, and that any person can perform monitoring.
2. **Cost.** (R6) Initial purchase price for equipment should be low.
3. **Detection.** (R8) Must be capable of detecting viable cells in each sample.
4. **Pathogens.** (R12) Need to be able to detect pathogens in addition to E. coli.

Current Monitoring Methods

The Current Monitoring Methods Breakout Session was attended by about 50 participants. The breakout session began with a discussion of how current technology and monitoring procedures can be improved upon to develop a more consistent monitoring approach to all beaches. Throughout the recommendation discussions, the group considered the economic, practical, and geographic constraints. The following 16 recommendations were generated:

1. Conduct daily monitoring for all lakes.
2. Monitor at each beach for turbidity, rainfall amount, wind direction, and standard water depth; and define specific monitoring parameters for each locality.
3. Identify beach-specific monitoring criteria.
4. Measure (monitor) parameters consistently.
5. Perform tests for both *E. coli* and enterococci.
6. Develop a list of risk factors for beaches that are risk-based, not just number based.
7. Build a complete database prior to modeling.
8. Develop appropriate sampling plan for each beach that includes at least three samples at each sampling event.
9. Develop rapid testing techniques to avoid closing the beaches a day late.
10. Develop consistent closing criteria using bacterial indicators.
11. Address the variable *E. coli* issue by defining "at risk" beaches and publicize.
12. Update freshwater epidemiologic studies to help characterize beaches and find better indicators.
13. Sample sand as part of the initial beach assessment.
14. Develop beach monitoring networks, databases, inventories to aid in grouping beaches.
15. Define what a beach is.
16. Incorporate final conference recommendations in the USEPA guidance document.

The group then prioritized the recommendations. During the prioritization process, the group defined themes for groups of recommendations. The prioritizations and themes are presented below.

HIGH PRIORITY

1. **Changes to Monitoring Methodologies.** (R2, R3, R4, R5, and R8) Monitor for turbidity, rainfall amount, wind direction, and standard water depth; define specific monitoring parameters for each locality and identify beach-specific criteria; measure parameters consistently; test for E. Coli and enterococci; and develop appropriate sampling plans that include at least three samples at each sampling event.
2. **Compile Data for Trend Analysis.** (R6, R7, R12, and R14). Develop a list of risk factors for beaches that are risk-based, not just number base; build a complete database prior to modeling; update freshwater epidemiologic studies to help characterize beaches and find better indicators; and develop beach monitoring networks, databases, inventories to aid in grouping beaches.
3. **Beach Assessments/Closings.** (R9, R10, R11, and R13) Develop rapid testing techniques to avoid closing the beaches a day late; develop consistent closing criteria using bacterial indicators; address the variable E. coli issue by defining "at risk" beaches and publicize; update freshwater epidemiologic studies to help characterize beaches and find better indicators.

MEDIUM PRIORITY

1. **Daily Monitoring.** (R1) Conduct daily monitoring for all lakes.

LOW PRIORITY

None